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ABSTRACT

The school performance of pupils in grades 2-4 of the French immersion program in operation in the Ottawa-Carleton public schools is evaluated in comparison with the performance of those in the regular English program. The results indicate that by the end of grade 2, pupils in the immersion program show the same level of cognitive development as pupils in the regular program, are behind their peers in the regular English program only in spelling, show no difference in mathematical skills, and exhibit comprehension of French lower than that of native speakers but significantly higher than regular program pupils. By the end of grade 3, immersion pupils lag behind in several areas of English language skills and in mathematical skills requiring the reading of English, but perform satisfactorily on measures of French reading and listening comprehension and show the same level of cognitive development as regular pupils. Upon completion of grade 4, the immersion pupils reveal for the first time a higher level of cognitive ability than regular pupils. In addition, at this point their English language skills, mathematical skills, and French reading comprehension are equivalent or superior to those of regular students. (Author/CLK)

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Bilingual Education Project: Evaluation of the 1974-75 French Immersion Program in Grades 2-4, Ottawa Board of Education and Carleton Board of Education

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This report presents the results of the 1974-75 testing program carried out by the Bilingual Education Project (BEP) of the Ontario Institute for Studies in Education in schools under the jurisdiction of the Ottawa Board of Education and Carleton Board of Education. The purpose of the testing program was to evaluate the French immersion program presently in operation in those two Boards. The study is a follow-up to previous evaluations (Barik & Swain, 1974, 1975). The present report covers Grades 2, 3 and 4. Kindergarten and Grade 1 classes were not tested in 1974-75 since testing at those levels had already occurred for three successive years, as called for in the design of the Bilingual Education Project (see previous reports for findings relating to those levels).

1974-75 Evaluation

Program. In Grades 2 through 4 of the French immersion program, pupils receive all their instruction in French (as was the case also in Kindergarten and Grade 1) except for one hour per day of instruction in English Language Arts taught by a teacher other than the French immersion home classroom teacher. In the regular English program, pupils receive from 20 to 40 minutes per day of instruction in French as a second language. (Such instruction starts in Kindergarten.)

Subjects. The following number of classes and pupils were involved in the 1974-75 evaluation.

	No. Classes		No. Pupils	
	Imm. Prog.	Reg. Prog.	Imm. Prog.	Reg. Prog.
Grade 2	13	13	277	287
Grade 3	12	12	288	245
Grade 4	9	9	165	189

In each school where the French immersion program is in operation, at least one class was selected from each relevant grade level (Grades 2, 3, 4) at which the program was offered. The comparison group consisted of an equivalent number of classes from the regular English program. These classes were selected from the same schools as the immersion classes whenever possible and if the school populations in the two programs (immersion and regular) within the school were comparable in terms of demographic characteristics. Where this was not the case, the comparison classes were selected from other schools providing an adequate match for such characteristics as socioeconomic level (based on information obtained from school authorities relative to the school population characteristics and the feeder or home district school of pupils attending an immersion centre outside their neighbourhood).

The classes at each grade level include a number of "split grade" classes which combine pupils from two grade levels. It was possible for either or both sections of a "split" class to be included in the

study. All pupils in any one class (or grade section in the case of split classes) were included in the testing program. In the analysis of the data, however, as in the past some cases were eliminated on the basis of several criteria, namely:

a) pupils indicated by teachers as having special problems (e.g., serious hearing or vision difficulties, emotional problems);

b) pupils indicated by teachers as having a very limited ability to understand and express themselves in English (e.g., recent immigrants);

c) pupils who were repeating a grade or conversely those who had entered their grade level only in January or later of the current school year;

d) pupils whose age fell outside a certain limit (± 18 months from "normal" age of 7 years for Grade 2, 8 years for Grade 3, 9 years for Grade 4), as a way of excluding pupils who probably belonged to c) above but where this information was not specified. (The evaluation is directed at pupils who are progressing at a "normal" pace in the curriculum, hence the exclusion of these children from the overall evaluation.)

e) pupils who had switched from one program to the other (immersion or regular) as of a specified date, depending upon the grade level.

As a consequence of these criteria, the number of pupils involved in the analysis is as follows:

Grade	Program	
	Immersion	Regular
Grade 2	263	263
Grade 3	263	229
Grade 4	154	170

Along similar lines and as in the past, in the case of performance in French all French scores of any pupils who came from a home background where French, either by itself or in conjunction with another language (English or other) was spoken as a regular means of communication (as indicated from a linguistic code assigned by the teacher and on the basis of French score criteria) were eliminated from the analysis.

Procedure. The testing was carried out either in a separate room set up specifically for this purpose or in the pupils' regular classroom. The tests were administered by a team of two trained female testers, one of whom gave the test, while the other ensured that the children were at the right place in the test and did not copy one another's work. For the English tests, the testers were native or native-like speakers of English, while for the French tests the directions were given by a fluently bilingual native or native-like speaker of French. In one instance (French Comprehension Test), all instructions were tape-recorded.

Design of Analysis. In the evaluation that follows, differences between the immersion and comparison groups are analyzed through one-way analysis of variance as well as analysis of covariance using age and IQ as covariates. The substantial number of classes involved in the evaluation of the Ottawa study makes it possible to use the class rather than the individual as the unit of analysis; thus, class means rather than individual scores serve as the data. In a few instances where only two or three classes were administered a specific test, however, the group average is calculated on the basis of individual scores rather than on the basis of class means.

Grade 2 Tests and Results (Cohort III)

The battery of tests administered to Grade 2 pupils at the end of the year (May - June) was the same as the previous year and consisted of the following (see Barik & Swain, 1974 for details):

a) Otis-Lennon Mental Ability Test (Elementary I Level, Form J), yielding an IQ score;

b) Metropolitan Achievement Tests (Primary II, Form F) containing four English language skills sections (word knowledge, word analysis, reading, spelling) and three mathematics sections (computation, concepts, problem solving);

c) French Comprehension Test, Level 1 (1975). This is the revised (and final) version of the test administered in previous years. The Level 1 test is intended primarily for Grade 1 immersion pupils. The test was administered to 10 Grade 2 immersion classes and 10 comparison classes;

d) BEP Test de Lecture, Grade 2: a French reading test administered to immersion classes only;

e) Test de Rendement en Français, Grade 2, the test of achievement in French employed in Quebec with native French-speaking students. This test was administered to the immersion classes only and was given at the beginning of December 1974 to permit comparisons with norms for the test, which is administered to French-speaking pupils in Montreal at the end of November.[2]

Results. The data for Grade 2 are shown in Table 1.

1. Age and IQ. No reliable differences are noted between the two groups with respect to either age or IQ. This corresponds to the previous year's results when the same cohort was in Grade 1. The IQ scores of the two groups are relatively unchanged (up by about two DIQ points) from their

Grade 1 results. In terms of American norms for the test, the two groups score in the vicinity of the 85th percentile.

2. English Language Skills. The only reliable difference between the two groups in English language skills as measured by the Metropolitan Achievement Tests is with respect to spelling, where the comparison group scores significantly higher ($p < .05$) when scores are adjusted for age and IQ.[3] This is in contrast to the previous year (Barik & Swain, 1974) where on the basis of adjusted (but not unadjusted) scores the immersion group scored significantly lower than the regular program group on all English language skills sections of the test except word analysis, which showed a similar trend. Interestingly, the present set of findings almost duplicates that obtained with Cohort I in Grade 2 two years previously (in 1972-73) on the basis of a different version of the test, where there was also no reliable difference between the two groups on any English section of the test on the basis of either unadjusted or adjusted scores, although the difference in spelling in favour of the comparison group came very close to significance (Barik & Swain, 1975). The Grade 2 data over the years thus do not seem to yield any definite trends relative to English language skills with the exception of spelling, although the findings can be interpreted favourably with respect to the immersion program, since in three successive evaluations at the Grade 2 level there has been no reliable difference between the two programs on the basis of unadjusted scores on any of the English language skills measured except spelling, and in two of the analyses these findings have been maintained when scores were adjusted for age and IQ. Thus, there

is support for the suggestion that following the introduction of English Language Arts into the French immersion curriculum for one hour per day in Grade 2, students in the program are able to catch up in English language skills to their peers in the regular program, who have been receiving such instruction since Kindergarten. (As will be seen, however, this picture is somewhat altered in Grade 3.)

In terms of American norms for the MAT test, both groups score generally in the 70-80th percentile range on all English sections of the test, except with respect to spelling for the immersion group, which scores at about the 60th percentile. In terms of (American) grade equivalents, the two groups are performing on a level a few months ahead of their own grade level (which is 2.9), the grade equivalent scores for the immersion group ranging from 3.0 (spelling) to 3.7 (word analysis) and those for the comparison group from 3.3 (spelling) to 3.7 (word analysis).

3. Mathematics Skills. Table 1 shows that there are no reliable differences between the two groups on any of the mathematics sections of the MAT or on total mathematics score, on the basis of either unadjusted or adjusted scores. These findings are similar to those of the two previous evaluations (with Cohorts I and II).[4] The results of three successive evaluations thus show that immersion pupils continue through Grade 2 to acquire mathematical concepts via French as well as their counterparts in the regular program do via English, and can apply these concepts in one language context or the other.

It is worth noting in Table 1 that, as in the previous evaluation, there is no reliable difference between the two groups on either of the

two subsections into which the problem solving subtest can be divided, one consisting of dictated items and one of problems which pupils read to themselves. This again demonstrates that by the end of Grade 2 immersion pupils are able to read, comprehend, and solve mathematical problems in English as adequately as pupils in the regular program, even though they do not normally encounter mathematics-related material in the English Language Arts component of their program. (The picture, however, again changes in Grade 3.)

In terms of test norms, the two groups score near the 70th percentile on the total mathematics score, with a certain amount of variation on individual sections as noted in Table 1. Their grade-equivalent scores (3.0 - 3.2) are compatible with their own grade level.

4. French Performance. Table 1 shows that on the French Comprehension Test, the immersion group scores very much higher than the comparison group (38.4 versus 10.6 out of 45; $p < .001$). The Grade 2 immersion group also scores much higher than regular program students in Grade 3 (14.2, Table 2) and Grade 4 (12.1, Table 3).

On the Test de Rendement en Français, the immersion group's score of 13.8 out of 30 places them in the stanine 3 range, which indicates a level of performance better than that of 11 to 22% of French-speaking Grade 2 pupils in Montreal for whom the test was developed. The score of the Grade 2 group is only slightly lower than that of 14.9 (stanine 4) obtained by the previous cohort (Cohort II) the year before, which however was administered the test 4½ months later in the calendar year than in the

present case.

On the Test de Lecture, the immersion pupils obtain a score of 12.8 out of 19, not very different from the score of 11.6 obtained by Cohort II the previous year. This level of performance is judged satisfactory by consultants to the French immersion program.

The French performance data are in agreement with those of previous evaluations. The results of three successive evaluations at Grade 2 thus indicate that pupils in the immersion program, although not reaching the same level of achievement in French as native French-speaking students, are much ahead of their peers in the regular program who are receiving instruction in French as a second language in level of French comprehension, and also show a satisfactory level of reading in French.

Grade 3 Tests and Results (Cohort II).

The battery of tests administered to Grade 3 pupils consisted of the following (see Barik & Swain, 1974 for details).

a) Otis-Lennon Mental Ability Test (Elementary I Level, Form K).

b) Metropolitan Achievement Tests (Elementary, Form F), containing four English language skills sections (word knowledge, reading, language, spelling) and three mathematics sections (computation, concepts, problem solving).

c) French Comprehension Test, Level 1; administered on a sample basis to 3 immersion and 5 regular program classes.

d) BEP Test de Lecture, Grade 3; administered to immersion classes only.

e) Test de Rendement en Français, Grade 3; administered to immersion classes in early December.

f) Test de Lecture "California", Level 1. This is a French (Belgian) adaptation of the California Reading Test intended for pupils in the second and third years of primary school. The test consists of reading vocabulary and reading comprehension sections. The test was given to two immersion classes on a try-out basis, to provide a measure of reading ability in French on a test intended for native French speakers. Norms for the test are available in relation to French-speaking children in Belgium.

g) English and French short story writing. Pupils from three immersion and three regular classes were required to write two short stories, each on the basis of a picture appearing in a test booklet. The immersion pupils were in addition asked to perform a similar task in French. The material collected is in the process of being analyzed and will be treated in a separate report. (See Swain, 1975, for evaluation of Grade 3 (Cohort I) writing skills.)

Results. The data for Grade 3 are shown in Table 2.

1. Age and IQ. There is no reliable difference between the two groups in age and IQ. This finding is similar to that of the same cohort the previous year in Grade 2, and the IQ measures are consistent across the two years (down by 2 - 3 points from Grade 2 to Grade 3). In terms of test norms, the two Grade 3 groups score in the vicinity of the 75th-80th percentile range.

2. English Language Skills.[5] When unadjusted scores are considered, the only significant difference between the two groups on the English language skills measured by the MAT is in relation to spelling, where the regular program pupils score higher than immersion pupils ($p < .01$). However, when scores are adjusted for age and IQ, regular program pupils also score higher in relation to word knowledge ($p < .01$) and total reading ($p < .05$). By the end of Grade 3, pupils in the immersion program thus still la their peers in the regular program in several areas of English language skills. These findings are somewhat at odds with those of the previous

year in Grade 3 for Cohort I, where the only significant difference between the two groups was in relation to spelling on the basis of adjusted scores.

(It is worth noting, however, that the findings for Cohorts I and II separately at the end of Grade 3 are consistent with their results at the end of Grade 2. As stated, Cohort I in Grade 3 showed a significant difference only in relation to spelling on the basis of adjusted scores, a finding similar to its end of Grade 2 performance (near significance on spelling with adjusted scores). Likewise, all significant differences relative to English skills reported for Cohort II at the end of Grade 3 were observed with the groups of the same cohort at the end of Grade 2, where the groups also differed on the reading section (in addition to total reading score) on the basis of adjusted scores.)

In terms of norms for the test, the present Grade 3 immersion group scores in the vicinity of the 75th percentile on word knowledge, reading and total reading, and at about the 60th percentile on language and spelling, while the comparison group scores in the 75-80th percentile range on all sections except language, where it also scores in the vicinity of the 60th percentile. In terms of grade equivalents, both groups score generally higher by a few months than their own level (from 4.1 to 4.6 in the case of the immersion group and 4.4 to 4.8 for the comparison group).

3. Mathematics Skills. Table 2 shows that on the basis of unadjusted scores there is no reliable difference between the two groups on any of the mathematics sections of the MAT or on total mathematics score. However, when scores are adjusted for age and IQ, the comparison group scores significantly higher ($p \leq .05$) than the immersion group on the mathematical concepts and problem solving sections of the test, and the difference in favour of the comparison group comes very close to statistical significance ($p = .06$) in relation to total mathematics. These differences

between the two groups are somewhat more pronounced than with Cohort I the previous year in Grade 3, where a reliable difference (on the basis of adjusted scores) was noted only in relation to the problem solving section, although a similar trend also occurred relative to total mathematics score. The problem solving section consists entirely of written problems to be read by the pupils, and reading of shorter mathematical statements is also required in the concepts section. It might thus be expected that immersion pupils, who in their formal English reading do not normally encounter mathematical material, would be at a disadvantage to pupils in the regular program with respect to these two sections of the test. On the basis of two successive evaluations at the Grade 3 level, there thus seems to be a slight lag at the end of the year on the part of immersion pupils relative to regular program pupils in mathematical skills tested in English, though this lag may be more a function of the unfamiliarity of immersion pupils with written mathematical material in English than a reflection of their level of mathematical competence as such.

In terms of norms for the test, both groups score in the vicinity of the 65-75th percentile range on all mathematics sections and total mathematics score, with the exception of the immersion group on the computation section (53rd percentile). The grade equivalent scores of the two groups are at or above their own grade level (3.9 - 4.6 for the immersion group, 4.1 - 4.7 for the comparison group).

4. French Performance. French immersion pupils score much higher on the French Comprehension Test than regular program pupils (40.0 versus 14.2). The figure for the immersion group is not much greater than that recorded for Grade 2 immersion classes (38.4), which is probably due to a "ceiling" effect, as both groups are scoring near maximum score (45).

On the Test de Rendement en Français, the immersion group's score of 16.0 out of 30 places them in the stanine 4 range on the basis of test norms, indicating a level of performance better than that of 23 - 39% of French-speaking Grade 3 pupils in Montreal. This level of attainment is similar to that reached by Cohort I the previous year, which however benefitted from a 4½ month lag in the administration of the test relative to the present group and the norm population.

On the BEP Test de Lecture, the immersion group obtains a score of 19.7 out of 26. This is also approximately the same score which was obtained by Cohort I the previous year (20.3), and indicates a satisfactory level of performance.

On the Test de Lecture "California", the two immersion classes given the test obtain a total score of 59.5 out of 70. In terms of Grade 3 norms for the test, which are given for each of the five sections in the test but not for the test as a whole, French immersion pupils score approximately between the 55th and 75th percentile rank, and are thus doing quite well in relation to French-speaking peers in Belgium.[6]

Grade 4 Tests and Results (Cohort I)

Grade 4 students were given the following tests:

a) Canadian Cognitive Abilities Test (CCAT), Nonverbal Battery, Form 1, Level B. This test was used to obtain an IQ measure in Grade 4. The Nonverbal Battery of the test consists of three subtests: Figure Analogies, Figure Classification, and Figure Synthesis. The test manual specifies that "the items in the subtests involve neither words nor numbers, and the geometric or figural elements used bear little direct relationship to formal school instruction. The subtests emphasize discovery of and flexibility in manipulating relationships expressed in figure symbols or patterns. The Nonverbal Battery measures more nearly what has been called 'fluid intelligence', that is, ability that is not bound by formal school instruction."

(The test suitable for Grade 4 in the Otis-Lennon battery (Elementary II level) requires reading in English for all items, and may thus be considered to be slightly biased against immersion pupils. On a try-out basis, however, the Otis-Lennon test was given to two Grade 4 immersion classes and the two corresponding comparison classes. The test contains both verbal and nonverbal items. A further reason for selecting the CCAT was to employ tests for which Canadian normative data are available.)

b) Metropolitan Achievement Tests (Elementary, Form G), the same test as used in Grade 3, which is applicable to both grade levels. (A different form of the test was used in Grade 4.)

c) French Comprehension Test, Level 1; administered only to four comparison classes. (The test was not given to immersion pupils since it would have been too easy for them.)

d) BEP Test de Lecture, Grade 4; a new level of the test developed by the Bilingual Education Project and administered to Grade 4 immersion pupils only. The test consists of 10 passages and 42 questions based on their contents.

e) Test de Rendement en Français, Grade 4; administered to immersion classes in early December.

f) Test de Lecture "California", Level II, for use with Grade 4 pupils; administered to immersion pupils only.

g) English and French short story writing; as in Grade 3, and involving three immersion classes (in English and French) and three regular program classes (in English only).

h) Cloze test in English and French. This test presents a text in which every nth word (in the present instance every 7th word) is missing and is indicated by a blank, which the pupil is required to fill in with the appropriate word. This test provides a general measure of language competence. Pupils in 9 immersion and 9 comparison classes were given such a test in English, and the immersion pupils were in addition given a similar task in French.

i) Oral Skills Test. A test of oral skills in French developed by the Bilingual Education Project was administered to three randomly selected pupils from each of five immersion classes. The data collected in g, h and i have not yet been analyzed. They will be considered in a separate report.

Results. The data for Grade 4 are shown in Table 3.

1. Age and IQ. There is no reliable difference between the two Grade 4 groups in chronological age, as has been the case with Cohort I since Kindergarten. Interestingly, however, a significant difference ($p < .001$) is observed, in favour of the immersion group, with respect to IQ. This is the first time that such a difference is noted for Cohort I; in all previous evaluations (Kindergarten to Grade 3), the two groups of that same cohort have not revealed any reliable difference with respect to IQ measure. A further analysis (based on individuals rather than class means) of only cases with both end of Grade 3 and end of Grade 4 IQ scores yields the same results: no reliable difference relative to their end of Grade 3 score, but a significant difference ($p < .01$) on their end of Grade 4 score. Furthermore, the Grade 4 result is significant ($p < .05$) even when end of Grade 3 score is employed as a covariate.

There is no immediate explanation for the departure in the trend of the IQ data for Cohort I in Grade 4 relative to previous years. It may be a function of the different test employed in Grade 4, which contains types of items not encountered in the Otis-Lennon series of tests administered previously. There is some evidence that early bilingualism favours what is called "cognitive flexibility" (Balkan, 1970; Cummins & Gulutsan, 1974; Peal & Lambert, 1962), and it is possible that the CCAT measures this to a greater extent than the Otis-Lennon test. It is to be noted, however, that findings for the Otis-Lennon test administered to the two immersion and two comparison classes are in the same direction as those for the CCAT. Immersion pupils with IQ measures on both tests score higher than regular program pupils on both the CCAT ($p = .07$) and the Otis-Lennon ($p = .06$), even though this last test requires readings in English. The Grade 4 IQ findings bear watching in subsequent years.

The IQ scores of the two groups obtained on the CCAT are somewhat lower than their end of Grade 3 score the previous year on the Otis-Lennon (by about 4 points for the immersion group and 6 points for the comparison group).[7] On the basis of Canadian norms for the test, the immersion group scores at about the 75th percentile and the comparison group at about the 65th percentile.

2. English Language Skills. Table 3 shows that on all English language skills sections of the MAT except spelling, the immersion group scores significantly higher than the comparison group on the basis of unadjusted scores. When scores are adjusted for age and IQ,[8] however, the findings are no longer statistically significant. The data thus indicate that the Cohort I immersion pupils, who had caught up to their regular program counterparts in English language skills by the end of Grade 3 except for spelling (Barik & Swain, 1974), remain on a par with them in all areas measured, including spelling, through Grade 4 (on the basis of adjusted scores).

In terms of norms for the test, the immersion group scores in the vicinity of the 70-80th percentile range on the English language skills sections and the comparison group in the vicinity of the 60-65th percentile range except for the language subtest (55th percentile). In terms of grade equivalents, the immersion group scores substantially above its own level (grade equivalent scores of 5.7 - 6.1) and the comparison group somewhat less so (5.2 - 5.4).

3. Mathematics Skills. The data show that the immersion group scores significantly higher ($p < .05$) than the comparison group on the mathematics concepts subtest; however, the difference is no longer significant when scores are adjusted for age and IQ. There are likewise no reliable differences on the other two mathematics sections or total mathematics score. Thus, at the end of Grade 4 immersion pupils taught mathematics in French remain on a par with their regular program peers

in mathematical achievement measured in English, including the comprehension and solution of problems presented in written form in English, which gave rise to difficulties in Grade 3 (with the present cohort as well as with Cohort II).

In terms of norms, the immersion group scores near the 75th percentile on the total mathematics score (with a range from about 65th to 85th percentile on the various sections) and the comparison group at about the 60th percentile (with a range from about 50th to 65th percentile on the three sections). With respect to grade equivalents, the immersion group scores one year above its own level (grade equivalent of 5.9 on total mathematics) and the comparison group (5.3) a few months above its level.[9]

4. French Performance. No direct comparison between immersion and regular program groups in French performance is possible in Grade 4, since the two groups were not given any test in common.

On the French Comprehension Test, as seen in Table 3, the comparison group obtains an average score of 12.1 out of 45, which is obviously lower than the score of Grades 2 and 3 immersion pupils, and also slightly lower than the score of regular program Grade 3 pupils (14.2). This last finding may reflect program differences; the regular program Grade 4 pupils have in fact had less contact time with French from Kindergarten through Grade 4 (a cumulative amount of 100-120 minutes) than Grade 3 pupils through the end of Grade 3 (a cumulative amount of 150 minutes).

On the Test de Rendement en Français, the Grade 4 immersion group obtains a score of 26.1 out of 40, which on the basis of norms for the test places them at the upper limit of the stanine 4 range (score of 22-26), indicating a level of performance better than that of 23-39% of native French-speaking Grade 4 pupils in Montreal, a finding comparable to that for the Grade 3 group.

On the BEP Test de Lecture, the immersion pupils obtain a score of 28.8 out of 42, which again appears to represent a satisfactory level of reading comprehension ability. That score represents approximately the same level of performance in percentage terms (68.9%) as Grade 3 pupils obtained on their level of the Test de Lecture (70.7%).

On the Test de Lecture "California", immersion pupils obtain a total score of 92.3 out of 135. In terms of norms for the test obtained with French-speaking pupils in Belgium, the immersion pupils ranks low on the vocabulary (synonyms and antonyms) sections of the test (at about the 25th percentile), but surprisingly high (85-90th percentile) on sections which require the pupils to select or consider specific aspects of words and follow directions, consult reference material, and comprehend written texts (reading comprehension).[10]

The French performance of the Grade 4 immersion group is thus on the whole quite satisfactory.

Summary

The results of the testing program carried out in Spring 1974 in Grades 2 - 4 may be summarized as follows:

1. At the end of Grade 2, pupils in the French immersion program:

   a) show the same level of cognitive development as pupils in the regular English program, as determined from an IQ measure;

   b) following the introduction of English Language Arts for one hour per day, are behind their peers in the regular English program only with respect to spelling in English language skills. These findings are more positive than those of the previous evaluation;

   c) continue to show that they are learning as much mathematics via French as their peers instructed in English, and that they can transfer this knowledge from French to English;

d) although still not at par with their native French-speaking peers in French achievement, exhibit a level of proficiency in French comprehension far superior to that of pupils in Grades 2 - 4 of a regular English program involving daily periods of instruction in French as a second language from Kindergarten on. They also show a satisfactory level of performance in French reading comprehension.

2. At the end of Grade 3, pupils in the French immersion program:

a) show the same level of cognitive development as pupils in the regular English program, on the basis of an IQ measure;

b) are behind their peers in the regular English program in several aspects of English language skills. The results here are somewhat less positive than those of the previous evaluation. Grade 3 immersion pupils however still perform at a level commensurate with or better than that of their own level of schooling in all English language skills measured;

c) are behind their peers in the regular program in mathematical skills requiring the reading in English of mathematical material. The results are again somewhat less positive than in the previous Grade 3 evaluation, but here also immersion pupils are performing at a level appropriate to their own level of schooling;

d) although not at par with Canadian French-speaking peers in French achievement, perform satisfactorily on measures of French reading and listening comprehension. They also do well in comparison with native French-speakers in Belgium on a reading test in French.

3. At the end of Grade 4, pupils in the French immersion program:

a) for the first time since being evaluated in Kindergarten, reveal a higher level of cognitive ability than pupils in the regular program. This finding may reflect a greater level of cognitive flexibility on the part of immersion pupils;

b) are on a par with their peers in the regular program in all aspects of English language skills measured;

c) perform equivalently to pupils in the regular program in mathematical skills, including the reading and comprehension of mathematical material in English;

d) are not at a par with Canadian French-speaking peers in level of French achievement, but perform satisfactorily in measures of French reading comprehension, and also compare quite well with native French-speaking pupils in Belgium in several tasks associated with reading.

The findings of the 1974-75 evaluation are seen as generally positive with respect to the French immersion program presently operating in schools under the jurisdiction of the Ottawa Board of Education and the Carleton Board of Education.

FOOTNOTES

[1]Thanks are expressed to the administrators of the Ottawa Board of Education and the Carleton Board of Education, and to the principals and teachers of the schools involved for their cooperation in this study. We also wish to thank Edna Nwanunobi for her assistance in the analysis of the data, and Sharon Lapkin, who acted as liaison officer with the two Boards of Education.

[2]We wish to thank the Commission des Ecoles Catholiques de Montréal, which developed the versions of the Test de Rendement en Français employed in the present study, and the Ministère de l'Education du Québec (Service de Mesure) which now administers them, for their cooperation and for granting permission to use the tests.

The Test de Rendement was in fact given in December to all immersion classes in the Ottawa and Carleton Boards, some of which were not tested at the end of the year. The results for all classes are similar to those relative to the classes in the end of year analysis discussed here. Similar considerations apply to Grades 3 and 4.

[3]As seen from the variation in the within-groups number of df's in Table 1, the analysis for the MAT does not involve all Grade 2 classes. In three schools formal instruction in English Language Arts is not introduced into the immersion program until Grade 3 (for the first time in 1974-75 in two of the schools and as in previous years in the third). Consequently, the MAT scores for the immersion classes in those schools relating to any section which involved English reading were excluded from the analysis (all subtests except the mathematics computation and concepts subtests, the latter involving a minimum amount of reading). The MAT analysis is thus based on the data of 10 or 13 immersion classes and 13 comparison classes.

[4]Except that in that first Grade 2 evaluation (Cohort I), based on a different version of the test, the immersion group obtained a significantly higher score in computation than the comparison group on the basis of unadjusted scores, but not of adjusted scores.

[5]The MAT data (English language skills and mathematics) for the immersion class in the one school where pupils in Grade 3 had not received instruction in English Language Arts the prior year in Grade 2 (see footnote 3) have been excluded from the analysis, except in relation to the mathematics computation section which does not involve any English reading. In Grade 4 (Table 3), however, that school has been included in the analysis since by then pupils have had two years of English instruction.

[6]The percentile figures cited have been obtained through interpolation from data presented in norm tables for the test, since on some sections there are substantial differences in the percentile ranks associated with adjacent scores. For example, on one section of the test involving the following of written directions, a raw score of 8 corresponds to a percentile rank of 58.96 and a score of 9 to a percentile rank of 82.07. The Grade 3 pupils, with an average score of 8.56 on that section, were given a percentile rank of 72 ($58.96 + .56(23.11) = 71.90 \rightarrow 72$).

[7]The IQ scores of both groups had systematically increased slightly from year to year in previous evaluations, due possibly to increased familiarity with the format of the test (Otis-Lennon series from Kindergarten through Grade 3). It is interesting to note that on this new test (CCAT), the IQ scores of both groups are closer to their score in the initial evaluation (Kindergarten, where the immersion group of Cohort I had an IQ score of 108.7 and the comparison group a score of 106.9).

The IQ scores of pupils administered the Grade 4 Otis-Lennon test

are also somewhat higher on that test than on the CAT. On the latter test immersion and comparison pupils obtain a score of 112.7 and 107.7 respectively (almost identical to the scores of the total groups, Table 3), but on the Otis-Lennon test the immersion pupils score 120.6 and the comparison pupils 115.5. The correlation between scores on the two tests is only moderate (r = .68 for immersion pupils, .64 for comparison pupils, .67 for both groups combined), indicating that the two tests are to some extent measuring different aspects of "mental ability".

[8]In view of the possible effect of type of program (immersion versus regular) on IQ in the course of Grade 4 (see above), the use of the IQ score as a covariate might be questioned. The rationale for using it is that to the extent that IQ affects performance on achievement tests, then the pupil's IQ <u>at the time of testing</u> (i.e., end-of-year score) is the appropriate variable to employ as a covariate, rather than his beginning-of-year or pre-program score. The effect of type of program on IQ is seen as an independent issue.

[9]It is worth noting that the better performance of the immersion group in Grade 4 on the basis of unadjusted scores is due not so much to an increase in its own level of performance as to a general decrease in the level of performance of the regular program group: while the percentile figures for the immersion group on all sections of the MAT (English and mathematics) are quite consistent with what they were the previous year in Grade 3 (Barik & Swain, 1974), those for the comparison group have uniformly decreased by about 10 percentile points on each section (except for <u>language</u> which remains unchanged).

[10]The percentile figures are obtained by interpolation from existing tables. The tables give percentile figures for only four of the six sections in the test (when two vocabulary sections are combined) as well as for the total test. On the basis of norms for the total test, the immersion group scores at the 38th percentile. However, these total test norms seem somewhat dubious in view of the percentile figures cited above for the four sections for which norms are available and the fact that on the two remaining sections which involved perceptual tasks, the immersion group obtains near maximum scores of 21.9 out of 25 and 19.8 out of 20.

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TABLE 1

Unadjusted and Adjusted Means, Grade 2 (Ottawa-Carleton 1974-75)

	Unadjusted Means				Adjusted Means (covs.=age+DIQ)				Percentile Rank (Unadj. $\bar{X}$)		Grade Equi	
	Immersion Group (13 classes)[a]	Comparison Group (13 classes)	F ratio	df	Immersion Group	Comparison Group	F ratio	df	Inmer. Group	Comp. Group	Inmer. Group	Comp. Grou
Age (mos., May '75)	93.42	94.03	1.68	1/24								
Otis-Lennon DIQ (end yr)	116.41	115.02	0.51	1/24					85	83		
Metro. Achiev. Test (stand. sc.)[b]												
a. Word knowledge (14-87)	60.68	61.76	0.39	1/21	60.08	62.22	2.77	1/19	76	79	3.4	3.5
b. Word analysis (12-72)	59.82	60.10	0.05	1/21	59.56	60.31	0.47	1/19	78	78	3.7	3.7
c. Reading (9-86)	60.60	57.58	0.62	1/21	60.29	57.81	0.40	1/19	79	69	3.4	3.4
d. Total Reading (a+c) (2-94)	60.58	61.01	0.06	1/21	59.90	61.53	1.62	1/19	79	80	3.5	3.5
e. Spelling (35-76)	58.55	61.15	2.82	1/21	58.25	61.38	5.19*	1/19	58	68	3.0	3.3
f. Maths Comput. (25-89)	57.94	56.84	0.37	1/24	58.18	56.50	0.76	1/22	74	67	3.1	3.1
g. Maths Concepts (23-97)	57.69	60.42	2.22	1/24	57.54	60.57	4.03	1/22	51	61	3.0	3.2
h. Maths Probl. Solv. (21-94)	61.24	60.68	0.06	1/21	60.72	61.08	0.05	1/19	65	63	3.1	3.1
i) Verbal items (raw, mx=17)	11.43	11.47	0.00	1/21	11.24	11.61	0.33	1/19				
ii) Written items (raw, mx=18)	11.97	11.88	0.01	1/21	11.81	12.01	0.19	1/19				
i. Total Maths (f-h) (6-102)	61.19	61.59	0.04	1/21	60.76	61.91	0.46	1/19	67	68	3.1	3.1
French Comp. Test, Level 1 Total (mx=45)	(10 classes) 38.39	(10 classes) 10.58	>100***	1/18	38.31	10.66	>100***	1/16				
Test de Rendement en Français Grade 2 (mx=30)	(13 classes) 13.82	-										
BEP Test de Lecture, Gr. 2 (mx=19)	12.83	-										

*** p<.001 ** p<.01 * p<.05

[a] See footnote 3 of text.

[b] Range of standard score scale given in parentheses.

TABLE 2

Unadjusted and Adjusted Means, Grade 3 (Ottawa-Carleton 1974-75)

	Unadjusted Means				Adjusted Means (covs.=age+DIQ)				Percentile Rank (Unadj. $\bar{X}$)		Grade Equiv.	
	Immersion Group (12 classes)[a]	Comparison Group (12 classes)	F ratio	df	Immersion Group	Comparison Group	F ratio	df	Inmer. Group	Comp. Group	Inmer. Group	Comp. Group
Age (mos., May '75)	105.80	106.16	0.30	1/22								
Otis-Lennon DIQ (end yr)	112.40	110.47	1.40	1/22					78	74		
Metro. Achiev. Test (stand. sc.)[b]												
a.Word knowledge (17-116)	69.75	71.70	1.44	1/21	68.94	72.45	9.50**	1/19	73	77	4.5	4.8
b.Reading (11-118)	69.93	70.04	0.00	1/21	69.23	70.68	1.31	1/19	74	74	4.4	4.4
c.Total Reading (a+b) (3-127)	69.25	70.36	0.48	1/21	68.43	71.10	5.73*	1/19	74	78	4.4	4.5
d.Language (34-136)	74.09	74.20	0.01	1/21	73.66	74.59	0.80	1/19	62	62	4.6	4.6
e.Spelling (39-94)	66.99	73.33	11.55**	1/21	66.19	74.07	24.67***	1/19	60	79	4.1	4.8
f.Maths Comput. (27-106)	66.21	68.43	2.17	1/22	66.02	68.62	2.64	1/20	53	64	3.9	4.1
g.Maths Concepts (27-106)	73.14	73.56	0.08	1/21	72.32	74.31	4.40*	1/19	72	73	4.6	4.7
h.Maths Probl. Solv. (24-106)	74.50	75.47	0.33	1/21	73.66	76.24	4.83*	1/19	69	72	4.4	4.5
i.Total Maths (f-h) (9-119)	75.30	76.48	0.67	1/21	74.68	77.05	4.00	1/19	67	69	4.2	4.3
French Comp. Test, Level 1 Total (mx=45)	(3 classes) 40.03	(5 classes) 14.20	>100***	1/6	38.06	15.39	>100***	1/4				
Test de Rendement en Français Grade 3 (mx=30)	(12 classes) 15.96	-										
BEP Test de Lecture, Gr. 3 (mx=28)	19.73	-										
Test de Lecture "California" Level 1 (mx=70)[c]	59.49	-										

***p<.001 **p<.01 *p≤.05

[a]See footnote 3 of text.

[b]Range of standard score scale given in parentheses.

[c]Unit of analysis=individual (2 classes, 43 pupils).

TABLE 3

Unadjusted and Adjusted Means, Grade 4 (Ottawa-Carleton 1974-75)

	Unadjusted Means				Adjusted Means (covs.=age+DIQ)				Percentile Rank (Unadj. $\bar{X}$)		Grade Equiv.	
	Immersion Group (9 classes)	Comparison Group (9 classes)	F ratio	df	Immersion Group	Comparison Group	F ratio	df	Immer. Group	Comp. Group	Immer. Group	Comp. Group
Age (mos., May '75)	117.59	117.70	0.03	1/16								
CCAT DIQ (end yr.)	112.44	107.11	15.51***	1/16					76	66		
Metro. Achiev. Test (stand. sc.)[a]												
a. Word knowledge (17-116)	79.72	76.05	5.28*	1/16	77.81	77.96	0.01	1/14	77	66	6.1	5.4
b. Reading (11-118)	80.17	75.85	4.85*	1/16	78.06	77.95	0.00	1/14	72	62	5.9	5.3
c. Total Reading (a+b) (3-127)	79.79	75.62	5.06*	1/16	77.78	77.62	0.00	1/14	74	64	5.8	5.3
d. Language (34-136)	83.82	79.19	8.01**	1/16	82.23	80.78	0.58	1/14	68	55	6.0	5.3
e. Spelling (39-94)	79.52	77.25	3.90	1/16	76.85	79.92	1.17	1/14	70	62	5.7	5.2
f. Maths. Comput. (27-106)	81.90	78.35	7.14	1/16	78.84	81.40	0.83	1/14	66	51	5.5	5.0
g. Maths. Concepts (27-106)	85.35	80.77	5.45*	1/16	82.55	83.57	0.23	1/14	81	65	6.4	5.6
h. Maths. Probl. Solv. (24-106)	85.08	81.96	2.22	1/16	82.06	84.98	1.85	1/14	72	62	6.0	5.5
i. Total Maths. (f-h) (9-119)	88.87	84.80	3.45	1/16	86.00	87.68	0.71	1/14	74	59	5.9	5.3
Test de Rendement en Français Grade 4 (mx=40)	26.06	-										
BEP Test de Lecture, Grade 4 (mx=42)	28.82	-										
Test de Lecture "California" Level II (mx=135)[b]	92.27	-										
French Comp. Test, Level 1 Total (mx=45)	-	12.15										

***p<.001 **p≤.01 *p<.05

[a]Range of standard score scale given in parentheses.

[b]Unit of analysis=individual (2 classes, 41 pupils).

***p<.001 **p≤.01 *p<.05